GEOVISUALIZATION OF GREEN SPACES WITH AUGMENTED REALITY

Javier Gallego Largo, Tomás Ramón Herrero Tejedor, Juan López de Herrera, Enrique Perez-Martin

Technical University of Madrid (UPM), Department of Agroforestry Engineering, Ciudad Universitaria, 28040 Madrid, Spain.

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Corresponding author:
Javier Gallego Largo
Tel.: 646692329
Fax.: -
e-mail: gallegolargo@gmail.com
Address: Hermanas Esquinas 12, Ocaña (Toledo)

Abstract

The management of green spaces in urban areas requires new techniques and instruments that provide all the information available to people.

It is intended to facilitate data-based services to citizens through the use of mobile devices in green spaces, parks and most visited public gardens. The selected area of study has been the Plaza de Oriente (Madrid) and its surroundings. Maps and images from different sources of information have been implemented in this research work. Then we proceeded to develop a database with woodland and existing cultural heritage. Finally, related this information using geolocation and augmented reality system.

We have created a system that allows the user to interact with the single orientation of the camera on your mobile device.

This application allows efficient use through the integration of mobile devices and the knowledge of the cultural heritage associated with the public space.

1 Introduction

The gardens, within cities or any other conglomerate, saved great features or references which are often unknown by the great part of the population that surrounds them as for those who visit these spaces, and often go unnoticed before them relevant aspects, that them would have known or know that they are in these green spaces. "Some parks and old gardens are home to valuable species of flora and fauna worthy of a special social care." [1]. In article 5 of the Act 8/2005 of protection and promotion of the woodland of the Community of Madrid, updated 19 June 2013 [2], indicates the priority of a full inventory of urban woodland. In this research, a database with the main features of each plant species as well as the information necessary for improved management and conservation of the study area is implemented. Intends to establish a control tool for operators in the area and locate in time, through periodic revisions, woodland conservation and health problems. In this methodology we include the cataloguing of architectural and sculptural elements of the garden under study.

The study area is part of the environment of properties declared with the figure for the protection of properties of Cultural interest (BIC) (Law 16/1985) in the Village of Madrid: Royal Theatre (declared the 30/09/1993) as the Royal Palace of the Oriente (04/06/1931) [3]. We choose a singular space green or garden of the Square East, "Lepanto and Cabo Noval", due to the movement of tourists and pedestrians that pass through this area to get to the Royal Palace [4]. This environment is appropriate for the realization of a computer application (App) about geo-location for natural green spaces, parks and public gardens.

The elements must be located in a clear and precise place, from which the system may require the information to display to passers-by. He is achieved through a well-structured database; the main thing

resides in having each element well identified with his "Shared Key". You don't need to be in the same Square East to display in our mobile device information given geo-positioned elements.

Currently there is a large amount of information, geographical, cultural, etc., relating to the architectural, sculptural, both elements that make up the green spaces, whether parks, gardens, Garden squares, etc., where sculptures, trees or shrubs copies significant and of great interest. The problem is when it comes to information of such elements, since often stroll through the parks and do not get the attention that they deserve, on the elements that surround us. It is partly due to ignorance of them have or by the lack of accurate information and easy access.

The ultimate goal is that citizen access very easily to this specific information of this type of places.

1.1 Area of study

The work area is located in the municipality of Madrid, in the downtown district, with a population of 142.270 habitants, a population density of 27.151 hab./Km2 and an area of 5.24 km2 this district. One of the most emblematic Madrid square´s and landscaping is first was the Square East, built on 1.5 hectare. It is a unique garden area, due to the movement of tourists and pedestrians that pass through this area to get to the Royal Palace [5]. This is an appropriate environment for the realization of APP's about geolocation for natural green spaces, parks and public gardens. The ultimate goal is that citizen will have easily access information specific to this type of places.

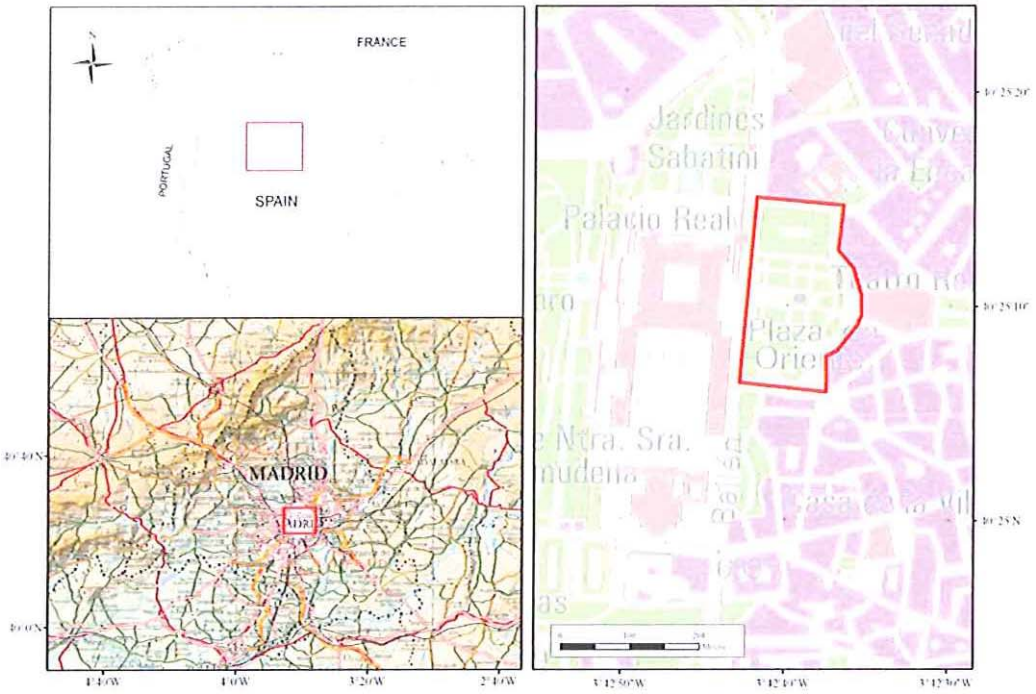

Fig. 1. Location of the study area. Spatial Reference System UTM-ETRS89 Zone 30N

2 Methodology

The methodology used to develop the proposed work is described in Fig 2. You are working in the geo-positioning of unique elements that surround us in these areas, as they are based: urban woodland, urban furniture and architectural details and aspects. The information and data obtained from the various plans of woodland and IDEE, web Map Service, historical catalogues (...) [6] along with the view that get us both any passer-by who comes to these spaces, it will offer us the possibility to keep in mind a number of clear and accurate information that will complement what we perceive with the view to walk and observe the unique elements integrated in the study area.

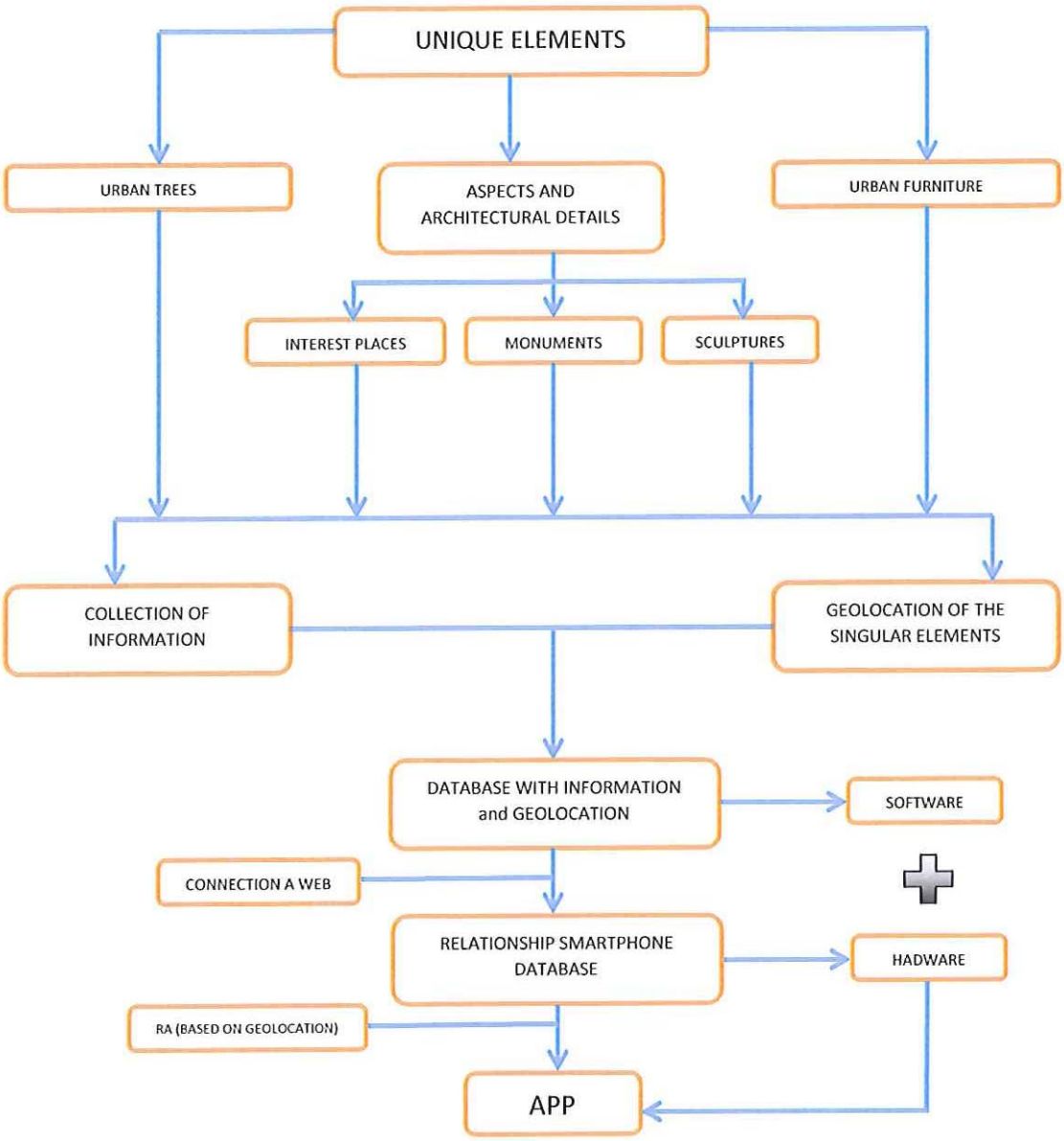

Fig. 2 Methodology for geo-positioning and display of unique elements.

For the realization of the Information System we use a mapping based on the Area of environment of the city of Madrid (Fig. 3). From the cartography and after several visits to the study area was designed a database with the required fields of the proposed Information System.

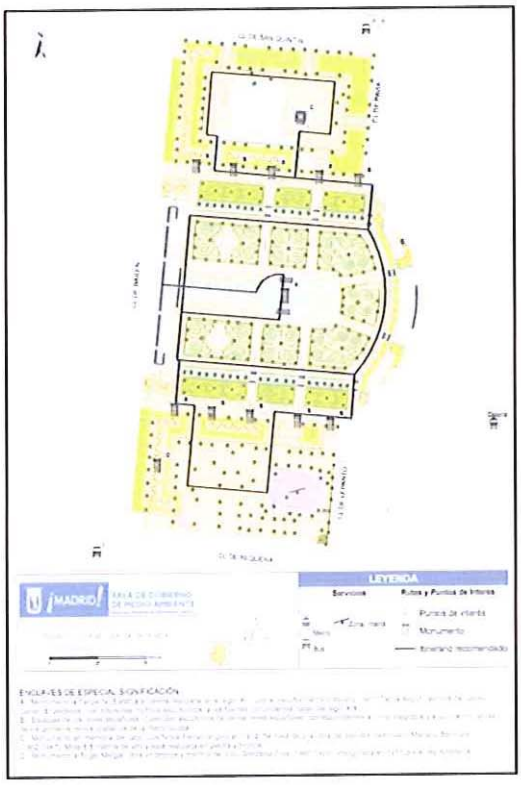

Fig. 3 Cartographic used in the preparation of the data base.

With the geo-positioning obtained from elements [7] and the implementation of data using POI's, could also offer information that can ignore about the elements that are displayed in real time, management by operators who keep these spaces, obtaining an improvement in management both area as greater precision when it comes to acting on the different elements to passers-by. The geo-positioning of elements is associated with the features implemented in the database. In the case of plant species (fig. 4) a certain fields associated with geo-location to improve the management and maintenance of the landscaped area.

Species	Image	Type pruning	Figure	Pests and diseases	Works	Appearance	Size	Other data
Magnolia grandiflora L.		Rejuvenation (10/11/14)	Pyramid	Powdery mildew. Treaty	Fertilization (N/P/K) (10/03/15)	Healthy	15 m.	

Fig. 4 Table layout associated with geo-located in parkland points.

In the same way, for the information of the existing cultural heritage (fig. 5) and the management and maintenance of urban furniture (fig. 6), we designed tables related to the main fields for later use.

Identification	Image	Description	Historical data	State of conservation	Protection	Other data
Euriclo (Rey Godo)		A statue that is part of a series to all the kings of Spain.	Reign: 466-484	Good	Statue outdoor	

Fig. 5 Design of table associated with geo points with patrimonial character.

Identification	Image	Description	State of conservation	Protection	Other data
Fuente ornamental		Stone fountain	Good	Protection index 2 historical	

Fig. 6 Table layout associated with urban furniture geolocalized points.

Both for the management of space, such as the display of elements with RA, is necessary to create a database containing every one of the elements which comprises it [8], main thing resides in having each element well identified with his Shared Key, is a secret key that is shared with the two parties using some secure channel until it is used. To create a shared secret key, key derivation function must be used. These systems almost always use symmetric key cryptographic algorithms. The term PSK is used in encryption for Wi-Fi such as WEP or WPA, where both the (AP) wireless access point and all clients share the same key a position [9] georeferenced that matches the place occupied in the scene of action and information we want to show [10] on the one hand to the passer-by and another area the operator actually [11].

3 Results

Pedestrians to activate the App on your Smartphone (see Fig. 7), send your GPS location, then performs a search within a range of 5 meters of perimeter (depending on the accuracy of the instrument used for viewing) the elements located on the perimeter, they appear as icons on the screen of our Smartphone. Then the user presses on the screen of your mobile device on the element which information, performing a "Query String" or request to the server with your ID, showing the details and issues previously allocated in the database to each element.

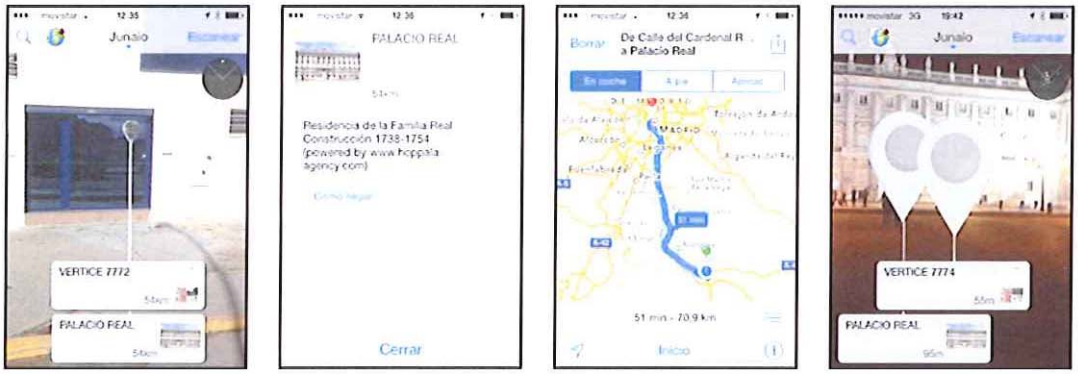

Fig. 7 Visualization in Smartphone display different screenshots with information of the POI´s.

The application may be linked to the server in various ways, contain the actual server where the information is located on the Smartphone, which leads to occupy a part of our mobile device data, either server can be remote in the only Smartphone, the requested information is stored and would be saved for future reference or otherwise in the Smartphone is not stored any information and always gets it from the remote server. This latest version has an advantage because does not collect data on the device, but on the other hand if you want to refer to information requested from the server previously, it is becoming to mobile data spending. With this process have been grouping the information and offer the users an optimal, orderly and geo-located, so you can access it from a Smartphone.

4 Conclusion

The methodology is simple and the cost is not high, as you can be seen done a test with software free to see the functioning and the impact that may result in its use. There are different ways to generate the App for these spaces, but the fortress that has is to show information that can be ignored on the elements in these areas to sensitize citizens with these spaces and get increased by the interest and care of these to passers-by. Similarly it can be used in reverse for management by operators and other personnel working in these areas.

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